Interoperability: Stop Blaming the Radio

Ronald P. Timmons

INTRODUCTION

One of the most pressing first responder issues emerging in the post-9/11 era is the need to improve emergency scene radio communications.[1] This concern actually pre-dates the terrorist attacks on the United States in 2001, and has been a commonly cited issue, in dealing with nearly every disaster or incident of major significance, for many years.[2]

The one word repeatedly heard in describing the problems relating to disaster scene communications is "interoperability." Without full consideration of all the causal factors, the charge has been to fix the oft-cited frustration of field responders being unable to communicate – and all the blame has gone to interoperability. The 9/11 attacks were a catalyst for an unprecedented amount of money spent on radio hardware. The numbers are staggering: estimates range up to five billion dollars in homeland security grants to enable and facilitate emergency communications.[3] Hurricane Katrina in 2005 again sent first responders looking for communications improvements.[4] This article challenges first responders to look beyond technical solutions and consider other factors impeding emergency scene communications.

Defining the issue has been difficult. Is *interoperability* the ability of all police officers to talk on radios to all firefighters at the same incident? Does interoperability refer to federal agencies having radio connection to state and local officials? Is interoperability only for those at the scene, or command post, or for those at the Emergency Operations Center as well? Will it be provided for every responder or command-to-command only? Or does interoperability address the wider issues of radio system coverage, frequency spectrum capacities, technology piece ergonomics, and alternate (non-voice) communications methods? Interoperability has been used as a catch-all phrase to describe a multitude of issues surrounding emergency scene communications. There are numerous reasons for inadequate disaster communications. Nationwide efforts, such as the Department of Homeland Security's Project SAFECOM, have begun to acknowledge an expanded definition of interoperability beyond the technical, to include behavioral and procedural elements.[5] Communication impediments do include insufficient radio infrastructure, but they are also influenced by behavioral reactions of first responders in stressful situations, dysfunctional intergovernmental relations, inadequate procedures and training, and general lethargy over the need to institute special operating policies differing from routine habits and practices.[6]

The early homeland security grants approach, immediately following 9/11, was to deploy equipment to patch radio systems and devices together, or purchase more individual radio units to communicate over obsolete and inadequate radio systems. The result has been the expenditure of huge sums of grant dollars on communications patching equipment, perhaps creating the mistaken impression

Report Documentation Page			*Form Approved* *OMB No. 0704-0188*

Public reporting burden for the collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington VA 22202-4302. Respondents should be aware that notwithstanding any other provision of law, no person shall be subject to a penalty for failing to comply with a collection of information if it does not display a currently valid OMB control number.

1. REPORT DATE **FEB 2007**	2. REPORT TYPE	3. DATES COVERED **00-00-2007 to 00-00-2007**

4. TITLE AND SUBTITLE	5a. CONTRACT NUMBER
Interoperability: Stop Blaming the Radio	5b. GRANT NUMBER
	5c. PROGRAM ELEMENT NUMBER
6. AUTHOR(S)	5d. PROJECT NUMBER
	5e. TASK NUMBER
	5f. WORK UNIT NUMBER

7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) **Naval Postgraduate School ,Center for Homeland Defense and Security,Monterey,CA,93943**	8. PERFORMING ORGANIZATION REPORT NUMBER

9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)	10. SPONSOR/MONITOR'S ACRONYM(S)
	11. SPONSOR/MONITOR'S REPORT NUMBER(S)

12. DISTRIBUTION/AVAILABILITY STATEMENT **Approved for public release; distribution unlimited**

13. SUPPLEMENTARY NOTES

14. ABSTRACT

15. SUBJECT TERMS

16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT	18. NUMBER OF PAGES	19a. NAME OF RESPONSIBLE PERSON
a. REPORT **unclassified**	b. ABSTRACT **unclassified**	c. THIS PAGE **unclassified**	**Same as Report (SAR)**	**17**	

Standard Form 298 (Rev. 8-98)
Prescribed by ANSI Std Z39-18

on the part of first responders that emergency scene communication will instantly and automatically be improved once the equipment is bought and plugged-in.[7] Before efforts such as the SAFECOM Program, "…interoperability efforts were uncoordinated and spread across a variety of Federal agencies." Total reliance upon technological solutions, without proportionate training and practice, greatly reduces the effectiveness of radio patching equipment.[8]

New radio gateway patching equipment was deployed nationwide, with little initial guidance or consensus for proper use. Since then, planning and training components have been introduced into the grant process and major urban areas have been compelled to file and test Tactical Interoperability Plans in 2006, but the migration of theory and specific manipulative skills, down to the user-level, has been slow to occur.[9] A major interoperability survey, just released, found that "…strategic plans for interoperability are the exception rather than the norm."[10]

This article suggests alternatives to overzealous equipment interconnection and instead urges a rethinking of the factors faced by personnel operating at a disaster. Common practice and policies should include new procedures for first responders when using radio equipment designed to improve interoperability. Communications improvement alternatives, such as training responders to prioritize radio traffic and employ alternatives, should be carefully weighed and tailored by first responder policy makers, while devising a policy best suited for their local jurisdictions.[11]

OPERATIONAL REALITIES

Beyond the mere technical aspects, policy makers need to consider the complexities facing those operating at the scene of emergencies. The radio is one tool of communication, but the overall process of communications deserves greater attention.

The daily routine of first responders does little to prepare those responders for the communications-intense environment typical of large scale disasters. Yet the universal reaction of response personnel at after-action reviews has been shock and indignation over failed communications at disaster scenes, followed by a tendency to blame the equipment instead of the people. The *9/11 Commission Report* goes into great detail about the failings of the radio systems of various agencies responding to the terrorist attacks in New York City in 2001.[12] Transcripts and recordings reveal there was almost constant chatter, albeit sometimes choppy and unintelligible. Setting aside the technical issues, which were many, a lot of people still talked on the radio; so while much was being *said*, *communication* was weak. More recent exercises have identified similar shortcomings. The observations and recommendations emanating from the civil-military *Strong Angel* exercise series echo many of the same frustrations about communications inefficiencies and recommendations for new ways of providing communications support.[13] The challenge will be in getting new concepts understood and accepted by the individual first responders in the field. Large-scale emergencies challenge the first responder community to find new ways to prepare personnel for situations that will be uncomfortable, unfamiliar, and

counter-intuitive. While there are steps that can be taken to stretch the communications resources deployed at emergency scenes, the logical approach is to manage the input (the amount of radio talking done at the scene) as well.

First responders tend to revert to normal usage habits in times of crisis, instead of modifying their use of the system when many agencies have been patched together, increasing system overload. The net result is that daily radio practices are accelerated and multiplied, with a dramatic increase in the quantity of communications by the responders at an incident, *and* these communications are squeezed into limited communications systems. The Department of Homeland Security (DHS) encourages first responders to "use interoperability solutions every day," so that "coordinated communications in response to any incident will be a natural instinct."[14]

Traditionally, there has been a tendency to devise hardware solutions for a whole range of challenges, instead of addressing human engineering issues.[15] The desire for a "turnkey" solution is understandable; the purchase and delivery of new equipment signals tangible evidence that something is being done. Considering that the kind of cataclysmic incidents we are preparing for are infrequent and the statistical exceptions, it is difficult to thoroughly assess the effectiveness of new equipment and procedures, even in the most realistic training exercise environment. Careful insight and informed projections are needed to ensure we do not find ourselves in the same state of dysfunction ten years from now, because we bought the equipment but did not change our culture and habits.

Funding for training accompanies some interoperability grant programs (signaling recognition of the importance of attention to non-hardware solutions) yet specific examples of actual training applications are difficult to find. What constitutes "interoperability training" is vague and nonspecific, leaving room for the requesting jurisdiction to include the component in their grant application while excluding specifics. Once agencies recognize the value of training to compliment the equipment they have deployed, training packages planned by DHS in the 2007-2011 planning window should facilitate those so inclined to participate.[16] To date there is disproportionately little collective recognition of the need for improved human interoperability communications procedures, as some first responder agencies presumably expect an out-of-the-box solution, based on building more communications infrastructure and patching radio systems together.

PHYSIOLOGICAL INFLUENCES

It is helpful to briefly step back from the radio hardware focus and consider the theater in which personnel responding to a disaster operate. Examination of psychological and human factors demonstrates that the most robust radio system imaginable may not deliver the expected results.

Sensory Overload

A lot is going through the minds of incident command personnel at the scene of an emergency; the amount of sensory input the brain has to process is immense. Just the process of *responding* to the incident in emergency mode takes a toll on the individual. First responders (in contrast to those working in stable environments) may be emotionally compromised when they arrive at the scene, before they are even called upon to perform critical decision making and clearly articulate commands to others.

When asked to describe the process by which emergency decisions were arrived at, a firefighter in one study indicated that he was not even aware that he *was* making a decision; it was more of a reflexive reaction than a conscious contemplation of a range of options to be selected from.[17] This is sometimes referred to as intuitive decision making and it reflects that people who are experts in their domain may react automatically without conscious thought and in the absence of full knowledge of the operational picture. More research is needed to determine the level of influence sensory overload and myopic operational tendencies exert on first responders expected to communicate in an optimal manner.

Cognitive Bias

Another consideration is the tendency to apply "cognitive biases," a state in which people tend to discount information that disconfirms their (correct or incorrect) preconceptions.[18] This can lead to the incomplete or inaccurate relay of key information due to missing pieces of the operational picture, further confounding effective communications. Decision makers are susceptible to cognitive biases when operating under stress, i.e., high workload, time pressure, and information ambiguity.

Speech Center Deficit

People within the first responder community can readily identify with the problem of speech center deficit, a phenomenon that sometimes occurs when someone is transmitting on a radio at the scene of a critical incident. Further study is needed to understand the role of hormone secretion, such as adrenaline and cortisol, plus other stress-related physiological reactions, which alter the voice pitch and inflection when someone is talking on the radio during a serious incident. As anyone who has listened to the famous recording of a reporter describing the crash of the Hindenburg ("oh, the humanity!") can attest, stress causes the human voice to take on a very unique quality, and the speaker can literally succumb to a state of "speechlessness."[19] Another example was Walter Cronkite's 1963 announcement of the assassination of President Kennedy, his voice cracking with emotion, as he was the first to break the story.[20] Mr. Cronkite did not witness the event, yet the weight of the information on a piece of paper caused an involuntary reaction influencing his speaking ability.

Recognition of this reality will allow us to scale back our expectations of effective voice communications at intensive emergency scenes. Responders should seek alternative communications methods and utilize message prioritization, for maximum value and improved operations.

Suppressed Emotions

Another major influence inhibiting clear communication is a state of *expressive suppression*, defined as "consciously inhibiting emotional expressions while emotionally aroused."[21] First responders force themselves to "stay calm" and control the emotion in their voice. Review of incident recordings reveals that staying calm is critical to maintaining orderly radio communications, yet it can trigger a cascade of additional stressors for those involved.[22]

One study found that when people suppress natural emotional responses, they experience elevated blood pressure, increased stress levels, disrupted communications, reduction in rapport building, and inhibited relationship formation.[23] These byproducts are hardly a recipe for articulate communications and collaborative resource deployment with other agencies.

LIMITATIONS INHERENT IN THE EMERGENCY ENVIRONMENT

The average incident commander generally arrives at the scene of a community emergency with little more than a portable radio and perhaps a clipboard of some sort. The largest first responder departments in the country may deploy drivers and aides with command officers, but they are the exception to emergency responses made nationwide. Command assistance, support, and technology are usually deployed on-scene as an incident escalates, but the capabilities to fund, staff, configure, and operate under pressure vary greatly across the country. While the level of support eventually brought in to a large-scale disaster provides assistance to the solo incident commander, it is during the first few minutes of a disaster that the incident commander is responsible for a wide array of critical duties and the chance for saving lives and preventing further consequences is greatest.

Once the influences affecting first responders are better understood and accepted, emergency trainers and planners are directed to several logical conclusions:

- There will be factors beyond the control of those present at the scene, impacting their ability to use radios in optimal ways. While training and experience can improve radio practices, particularly intense incidents (such as those where people are critically injured, awaiting rescue, or actively threatening others) should be anticipated, along with the propensity of those involved to be impacted emotionally. Emotional handicap should be anticipated in dire command circumstances.

    During periods of high-volume, high-stress crisis situations, the user's expectation of and reliance on good communication continues, but the increased pace and load on the radio system, combined with the unique

emotional influences present, typically acts to hamper, rather than facilitate, the communications process.

- Radio communications during cataclysmic events will not be as expedient or helpful as during lesser emergencies. People are creatures of habit and tend to revert to practiced behaviors in times of crisis. The same talkative practices used during daily, routine operations quickly collapse under maximum radio system loading.

  During periods of routine operations, confidence in using the radio equipment increases. The user generally has clear air for conversations with coworkers and dispatchers, communicating through casual or routine turns of speech. With light radio traffic and normal emotional states, first responders are able to conduct efficient business conversations on a daily basis. Nothing in this pattern adequately prepares the user for greatly accelerated and congested crisis communications.

- Consider how common it is for a member of the general public to feel apprehensive about delivering a routine speech to a large room of people, even with adequate notice and preparation. Then juxtapose the challenge inherent in disaster scene communications that requires verbalization, (ideally in optimized, unambiguous syntax) of a pattern of words containing specifics about an emotionally-charged emergency situation, the details of which were unknown just minutes prior. This helps to explain the dysfunctional communications experienced by disaster scene radio users.

- Personal protective equipment (PPE) tends to hamper access to and utilization of radio equipment. Despite improved equipment designs evolving over the years, this continues to be a factor. In addition, many non-firefighting personnel have been issued PPE through homeland security grants, but have never tried to use their radio equipment while wearing it.

The most well-intentioned plans and procedures can look very good on paper and fail to translate into valuable guidance during times of crisis, unless the limitations of the human physical and cognitive functions are considered. It is wise to anticipate the physiological limitations experienced by people under stress, and devise practical work-arounds to allow some level of prioritized communications to occur.

Emergency Communications Under The Microscope

Accepting the aforementioned limitations inherent in emergency communications, we can benefit from detailed study of communication habits of first responders. Metrics obtained through radio system loading data provide valuable confirmation or counterpoint to anecdotal experiences reported by participants during routine incidents and training exercises. Decidedly less scientific, but nonetheless valuable, are user comments gleaned from after-action

reviews, during which communications issues are frequently discussed. Opportunity to quantify improvement needs can be identified in post-incident transcript reviews, during which the effectiveness of communications can be rated.

Transcripts and recordings from numerous critical incidents involving various combinations of fire, police, medical, local, and mutual aid units, responding to single and multi-jurisdictional incidents, were analyzed while conducting thesis research at the Naval Postgraduate School.[24] This included assessing incident transcripts from New York City on September 11, 2001, for timely and effective delivery of messages. Radio communications from a multi-jurisdictional fire department training exercise were evaluated in detail, revealing several opportunities for non-technical improvements.

Analysis of data from the training exercise communications studied showed the percentage of radio messages needing to be repeated was 4.9 percent. Another 11.9 percent of the radio messages went unacknowledged (thirty-three out of the fifty-one unacknowledged messages were to the incident commander), and were presumed to be unheard. In addition, 2.6 percent of the communications turns were judged to be a questionable use of radio airtime, e.g. face-to-face message exchange may have been more appropriate, the speaker was communicating redundant information, or information of questionable value was transmitted.[25]

Since radio system congestion is a commonly reported frustration, it is critical to find ways to make more airtime available. The collective total of repeated, unacknowledged, and questionable communications turns in this exercise equaled 19.4 percent of all messages, indicating a significant opportunity to reclaim nearly one-fifth of all radio airtime lost to such inefficiencies.

Unacknowledged messages to the incident commander are an area of concern, and were universally noted in training exercises, as well as in the recordings of actual emergencies. Further research is needed to fully assess predominant reasons for such inattention, since radio problems and clarity of the message were not typically noted on recordings. The incident commander was presumably distracted, overwhelmed, or attending to something else at that instant.

HOW TO MAKE IT BETTER

One way to improve the communications efficiency rating is to provide training on better prioritization of radio messages while introducing the concept of communication alternatives to public safety radio. Face-to-face communication and decentralized emergency scene, sector-level, task coordination are examples of ways to achieve objectives without use of radio resources. Modifications to the status quo will be needed before the next major leap in emergency scene communications efficiency can be achieved.

New Scene-Command Paradigms

Recognizing the intensive communications needs for efficient emergency scene success, we should strive to find new and better ways to provide a support system for first responders at the scene. New technology holds the promise of better emergency scene communications support, but it will require examination of how personnel are deployed and operate during an emergency. Over the last two decades, some large first responder departments have begun to transition to a fixed base of command operations at large emergencies, moving command personnel from literally standing in the street, to vehicle or building-based command posts. Homeland security grant dollars have facilitated the purchase of command post vehicles for many jurisdictions, yet there is general inattention to the need to prepare staff to optimize such resources. Mobile command facilities provide a greater array of communications support, beyond that which can be dependably delivered over handheld, portable equipment. It admittedly takes time and personnel resources to deploy such assets, so there is a need to start with operations more limited in capability, but the eventual deployment of enhanced capabilities will be of assistance in extended operations.

It would be beneficial to assign personnel at the emergency scene exclusively to facilitate communications support for the incident commander. Some large first responder departments have such scene-based communications capabilities (aides, chiefs' drivers, etc). Other agencies should seek creative ways to develop such expertise, perhaps detailing first-arriving support personnel (who often self-dispatch to large-scale incidents), or deploying special tactical dispatch personnel. Greater operational efficiency, enhanced crew safety, and "reclamation" of scarce radio airtime can be expected if communications support personnel operate inside a quiet environment, at the command post, with the incident commander. Communications specialists should be supplied with adjunct devices, such as headphones and visual displays, allowing them to pay close attention to radio traffic and data streams, thus assisting the incident commander in communications continuity.

NIMS-The 10,000 Pound Elephant

In the recordings reviewed, considerable airtime was consumed in coordinating agencies. It was often apparent that separate commands were being employed at the same incident. The federal government has mandated the National Incident Management System (NIMS) as a condition of grant funding.[26] While many agencies claim to know and use NIMS, evidence of its field application is weak, especially in relation to multi-agency command from a single incident command post. Jurisdictions claiming to be enthusiastic adopters are often hard-pressed to show application of sound incident command and NIMS principles at emergency scenes ranging in complexity from the New York City attacks on 9/11, involving two 110-story buildings, to more routine traffic accidents and building fires.[27]

The reasons for slow or no adoption of NIMS range from traditional resistance to change, to a state of general denial of the possibility that large-scale emergencies can happen in any given jurisdiction, to what may be the biggest factor of all: a reluctance to answer the "who's in charge" question amid historic

turf battles, especially those related to police vs. fire department rivalries, and/or squabbles between various levels of government. Cordiality between agencies on the surface can belie the lack of NIMS application in the field.

Full implementation across all disciplines and jurisdictions will need to happen before optimum value is derived from the NIMS edict. A centerpiece of the new procedure involves dividing the incident into manageable pieces, with command officers assigned to task and/or geographical locations. These commanders can assume considerable line-of-sight and face-to-face communication with people in the task groups, thus eliminating much of the radio traffic at a critical incident. While the fire service has universally practiced incident command system principles for many years, law enforcement and other agencies have significant work ahead in transitioning from superficial, on-line NIMS overview training to effective, specific, and tactical NIMS implementation.

The *Unified Command* concept within NIMS is optimal when commanders from each agency are present at the same incident command post. While the separate command post concept is the practice in many locales, it probably has more to do with avoiding the "who's in charge?" issue than it does with any practical advantage. Unified Command is much more difficult when communications devices must be relied upon, instead of the optimal communications method: face-to-face.

Governance

Some attention is starting to be paid to non-technical interoperability issues, including common governance and procedural recommendation.[28] But the most recent round of field tests revealed there is more work to be done in that regard. One U.S. Department of Justice official recently commented that governance is the greatest gap being found in field testing of interoperability initiatives.[29]

The drive for greater interoperability of radio communications has triggered more inter-agency collaboration, but there remains a need for greater control and governance over the use of interoperability equipment. While many jurisdictions have some history forming an alliance with a neighboring jurisdiction, it is rare to see all neighboring jurisdictions participating equally, and to see cross-jurisdictional policies (police/fire, local/county/state/federal, etc.). With the hardware now available to form ad hoc communications networks, agreement on common boundaries of utilization will be critical; otherwise inadvertent system overload is likely.

Standardized Nomenclature

Interoperability initiatives have brought additional focus on the issue of agency-specific codes used over radio systems. Valid concerns have been raised about the presence of non-standard and often conflicting codes being used by many jurisdictions, along with the potential for critical errors in times of crisis communications. While some departments have phased-out radio codes in recent years, others still cling to them as an ingrained operating practice and custom.

The International Association of Chiefs of Police (IACP) recently addressed the Department of Homeland Security's (DHS) posture that 10-codes and other codes used over radio systems should be eliminated during daily use within the NIMS implementation initiative. At the 2005 annual meeting of the IACP, DHS Secretary Michael Chertoff yielded to the hue and cry of the membership to leave everything alone, as it relates to radio codes.[30]

This offers further evidence that we have a major "uphill battle" regarding any substantive changes to customs and traditional operating policies, even when the compelling need to overturn an existing practice is evident.

Hand Piece Ergonomics

Often the radio itself is blamed, when operator error is really the cause. Public safety radio users frequently are not able to do much more than turn the power on, adjust the volume, push to talk, and maybe change a few channels. These users, like many people, may exhibit the "Blinking 12 syndrome," using only a portion of a technology product's capabilities (like the blinking, unset clock on home video equipment,) instead of reading instruction manuals and experimenting with seldom-used features.

The challenge for the future will be to configure radios to be more intuitive to use, while providing more training (and a commensurate level of motivational self-interest,) to the field responders who will need to know how to use their radio as a life-safety device, and during infrequent circumstances, immediately recall how to change to another bank of channels. Manipulating portable radio settings is a difficult task to accomplish under ideal conditions; the chance of successful selection of a different channel bank is much more challenging under stressful, adverse operating conditions.

Data Displays

Given the limitations of delivering voice communications at intense incidents, a potent possibility resides in providing non-voice data to operational commanders. Incident recordings confirm that precious airtime is often consumed just to relay to incident commanders lengthy lists of units responding to the disaster. Because of the way data is transmitted over communications systems, more data can be delivered (within the same amount of airtime) than a commensurate amount of voice communication. Using more data transfer, as an alternate to some voice information, reserves the most intuitive and valuable form of communication – voice – for the highest priority messages.

NEW PROCEDURES NEEDED

Specific procedures necessary to derive maximum benefit from the new interoperability equipment being deployed for homeland security communications improvement need to be addressed. Communications procedures should include teaching ways to economize use of communications assets, by placing priority on life-safety radio transmissions and practical, non-

radio alternatives for communicating during emergencies. Improved procedures should address application of NIMS incident management principles emphasizing the use of staging areas, sector control by assigning functional units under the control of a sector command officer, and application of face-to-face communications practices.[31]

In reviewing numerous recordings of critical incidents, it is apparent that the best practice would involve modification of radio system utilization, at the source, to optimize the quality of communications to produce "better" not "more" communications turns. Such a "less is more" posture, involving radio system use, runs counter to the policies practiced in daily response to routine incidents. All users must make a conscious effort at disaster scenes to resist the habits practiced in normal operations and limit their use of the radio system for the highest priority life and safety needs.

To overcome the inherent limitations of patching multiple radio system units onto a common operational platform, new procedures should be implemented to prioritize the use of limited radio resources. Review of numerous critical incidents involving various combinations of fire, police, medical, local, and mutual aid units, responding to single and multi-jurisdictional incidents, found a common pattern of influences:

1. Responding units tended to stop at the first injured person encountered at the periphery of the incident and call for an ambulance to that specific location, even when it should be obvious that a mass casualty incident was underway, involving dozens, or even hundreds of victims.

2. Turns of communications devolved into clipped, ineffective bits, to the point where it was difficult to tell who was talking to whom.

3. If a field unit expressed vocal excitement, the dispatcher's voice tended to also rise in pitch and pace. The dispatcher plays a key roll in keeping everyone calm through the use of a controlled voice inflection and by exuding a stoic confidence.

4. Units prefacing their transmissions with key words, such as "urgent" "priority message" or "emergency traffic," received greater attention than those continuing to talk unacknowledged and without preface, even if they conveyed urgency in the pitch and pace of their speech.

5. Many incidents eventually got to the point where dispatchers and incident commanders tried to control and reduce the volume of radio traffic by who was talking. Requests such as "all units stand-by" and "command officers only on this channel," were commonly heard.

6. A relatively small number of units dominated a majority of the airtime, often with non-critical matters, while many units said nothing. The channel-loading was unevenly skewed to a small portion of those present.

7. The most assiduous dispatchers and commanders tried to anticipate those things the field users might ask, and acted to broadcast a summary of

information, before it was asked for, in an effort to preempt use of the radio channel for repetitious information requests. This included best access routes, staging areas, triage points, command post locations, and brief situational updates. This relatively small menu of variables produced a disproportionate number of repetitious and superfluous radio transmissions.

8. The use of timed milestone updates gave the most even flow of information, acknowledging that time often gets out of phase – either faster or slower – to the perception of those involved at the scene. Many dispatch computer systems have automated features to trigger prompts to the dispatcher at timed intervals, i.e. every ten or twenty minutes. Dispatcher-initiated requests for updates from incident commanders, at timed intervals, aided in developing an operational picture for those at the scene, as well as for support players off-site (still responding, or at alternate locations, such as Emergency Operations Centers).

9. Listening to recordings after an incident readily allows for identification of inappropriate assumptions, ineffective ("not what was meant,") communications, and unacknowledged speech turns not evident to those involved at the moment. This can be attributed to the calm environment the reviewers are in and the lack of multi-sensory stimuli experienced by those responding as the incident was actually occurring. While it is not possible to eliminate all distractions and simultaneous demands placed upon those operating at emergency scenes, the inference here is that great value would be derived from managing and limiting sensory input at the scene.

Quantifiable Triggers

Incident recordings reveal common themes in the contention for airtime: requesting individual resources unit-by-unit instead of in large task-force complements, and making requests that are relatively minor in contrast to the overall operational situation at hand.

There is a need for commanders of future cataclysmic events to monitor quantifiable triggers, such as:

- number of victims,
- area involved,
- configuration of structures, and
- type of attack methods used.

These cues can predict the impending overload of communications resources.

Such events should compel (via written procedure, training, and practice) the use of alternate communications tactics and contingencies. The "walking wounded," for instance, should be encouraged to keep walking or redirected to a central treatment area and radios should be used for priority messages only. Such

strategic use of radio systems during disasters has not generally been part of first responder orientation and training to this point.

CONCLUSION

Homeland security efforts have been heavily focused on interoperable radio communications for local emergency responders. Recent homeland security dictates have listed interoperability as the number one focus for those seeking grant funding. The whole realm of communications behaviors needs to be considered, along with technical considerations.

Post-disaster analyses, including the *9/11 Commission Report,* have described a common frustration with ineffective communications at the scene of emergencies.[32] Assumptions made by the misinformed general public, as well as by some public-sector policy makers, have led to misguided solutions. Some solution strategies currently being pursued may actually make matters worse, instead of better (overloading systems by patching too many users together), despite billons of public dollars awarded through grant funding to *improve* communications.

The early assumption was that first responder communications issues were technical, i.e. separate radio platforms, or coverage issues leading to ineffective emergency communications. Such assumptions have a degree of validity, but the predominant focus should shift to procedural and human factors, considering the realities of how people perform during times of stress, rather than how to patch more radios together. Reviews of public safety radio transmissions during disasters, including the terrorist attacks of September 11, 2001, reveal a mélange of words and excited phrases that are often conflicting, disconnected, or superfluous.

Emergency scene communications dynamics are inherently complex because many diverse organizations become involved. A high degree of pre-incident diplomacy is necessary to create the governance process needed for such unprecedented levels of interagency collaboration required by the interoperability movement.

The greatest need is to modify procedures and behaviors, both in daily use and during disaster operations. We need to retrain field personnel in optimal radio operation procedures aimed at prioritizing radio transmissions for life safety, overall situational awareness status, and broad command and control.

Due to the criticality of communications during crisis events, it is imperative to devote resources to developing and implementing new procedures for responders during emergencies. This serves to increase awareness of the need to communicate differently in overload situations, instead of following the typical practice of loading more and more radio traffic into common radio space, to a point where communications turns are not accomplished and responder safety and effectiveness is impaired.

Communications are most critical during the response phase of an emergency. During the response phase, life safety matters are typically at their most acute state. Responders must deal with people awaiting rescue and treatment, while

focusing on apprehension of the perpetrators, damage assessment, and general situational status reporting. The stress of these missions tends to produce emotionally charged communications during the first hour of the incident, before elaborate field support systems can be established.

Since people revert to practiced behaviors when confronted with stressful situations, it is critical that the tendency of first responders to talk too much during an emergency be corrected. Spending more time listening to what is being said and saving the precious radio spectrum for prioritized life-safety-traffic-only communications is essential – and represents a new policy that needs to be taught and practiced. This will require specific guidelines, training, practice, and application by first responders and public safety communications personnel.

A *crisis communications plan* is advocated whenever command is established at the scene of an emergency where a large number of responders are present, and radio communications are beginning to degrade. Features of this plan should include:

- Encouragement of face-to-face communication within NIMS sectors;

- Designation of staging areas (where responders are directed to muster before deployment in the hazard zone), assigned by the incident commander, where units report and return silently to staging officers at those locations, without radio usage;

- Establishment of a dedicated communications path limited exclusively to the incident commander for situation status reports and requests for additional resources from/to dispatch;

- Coordination of command and dispatch to broadcast situational status reports at regular intervals; and

- Broadcasting to field units that life safety messages are to be prioritized, and they are to use other communications means for minor matters.

These modifications sound easy, even self-evident, but it is very difficult for people faced with a crisis to do anything other than what they have practiced in routine, daily operations. The recommendations made here represent a realistic set of alternatives for addressing the complex set of communications behaviors and influences present at disaster sites. These recommendations include engineering communication assets to fit the way first responders will likely react in emergency situations and introducing the new interoperability hardware with a commensurate level of relevant procedural changes and practice. First responders expect their communication issues to be fixed by radio hardware, yet strategic planning efforts show us it is time to shift the focus to human factors engineering and realistic acknowledgement of the limiting factors inherent at emergency scenes.

Ronald P. Timmons, fire chief (ret.), Ridge Road Fire District, Rochester, N.Y., is presently the director of public safety communications for the city of Plano, Texas. He holds an MPA, and

*earned a master's degree at the Naval Postgraduate School's Center for Homeland Defense and
Security. He is pursuing a PhD in public affairs at the University of Texas at Dallas.*

---

[1] National Commission on Terrorist Attacks Upon the United States, *The 9/11 Commission
Report: Final Report of the National Commission on Terrorist Attacks Upon the United States*
(New York: W.W. Norton & Company, July, 2004), 280; Eileen Sullivan, "Interoperable Radios
for First-Responders Woefully Lacking Despite Billions in Funding," *Congressional Quarterly*
(September 2006), http://public.cq.com/public/20060911_topten_interop.html.

[2] "One of our biggest problems was communications," FDNY Assistant Chief Donald J. Burns,
chief of operations, stated after the 1993 bombing of the World Trade Center. Chief Burns
returned to the World Trade Center on September 11, 2001, and lost his life while commanding
personnel under similarly compromised communications conditions. U.S. Fire
Administration/Technical Report Series, "The World Trade Center Bombing: Report and
Analysis," (New York , 1993), 14, 32, 38-39, 51,
http://www.usfa.dhs.gov/downloads/pdf/publications/tr-076-508.pdf; National Institute of
Justice, Office of Justice Programs, U.S. Department of Justice, "Guide to Radio Communications
Interoperability Strategies and Products," *Project AGILE Report* (April 2003), 2,
http://www.safecomprogram.gov/NR/rdonlyres/8F919F4D-B077-4338-876D-
98F440C90606/0/Guide_Radio_Comm_Strategy_and_Products.pdf; see also Donald A. Lund,
"The Lessons of Non-Interoperability in Public Safety Communication Systems," *The ATLAS
Project, Advanced Technology in Law And Society* (University of New Hampshire, Benchmarks
and Blueprints, April 2002), 3-7.

[3] "By some estimates, between $2.5 billion to $5 billion in funds were allocated in fiscal 2004 just
for interoperable digital radios built using the Association of Public-Safety Communications
Officials' Project 25 standard. The exact amount going solely to interoperability projects can't be
determined because much of the funding comes in the form of block grants, by which states
receive a large lump sum and allocate the funds as they see fit." Lynnette Luna, "Unclogging the
Grant Pipeline," *Mobile Radio Technology*, May 1, 2005.

[4] "Some of the basic weaknesses exposed by September 11 – and, one would have presumed, since
fixed – seemed instead to linger. For example, police and other officials were unable to
communicate as their cell phones failed and satellite phones took days to arrive." From
"Unprepared," *Washington Post,* September 5, 2005, Editorial page.

[5] "Achieving interoperability requires more than technology. Shifting all the elements requires a
comprehensive, coordinated strategy. Interoperability is about technological, strategic, tactical,
and cultural change, as much as it is an issue of one radio transmitting to another." U.S.
Department of Homeland Security*,* The SAFECOM Program, *SAFECOM: The Road to
Interoperability* (Washington, D.C., 2006); also "Interoperability is more than just information
exchange. It includes systems, processes, procedures, organizations, and missions over the life
cycle and must be balanced with information assurance." U.S. Department of Defense,

Instruction Number 4630.8, June 30, 2004, Section E2.1.32, http://www.dtic.mil/whs/directives/corres/pdf/i46308_063004/i46308p.pdf.

6 U.S. Department of Homeland Security, *SAFECOM* program information at http://www.safecomprogram.gov/safecom/interoperability/default.htm.

7 Paul Davidson, "Compatible Radio Systems Would Cost Billions," *USA Today*, December 29, 2005.

8 *SAFECOM: The Road to Interoperability.*

9 "As part of the Department of Homeland Security (DHS) Fiscal Year 2005 Homeland Security Grant Program (HSGP) guidance, each Urban Area (UA) receiving Fiscal Year 2005 Urban Area Security Initiative funds must develop a plan to achieve tactical interoperable communications across all jurisdictions in the UA and test the plan through a full-scale exercise." U.S. Dept of Homeland Security, Office of Grants and Training, *Tactical Interoperable Communications, Plan Review Process* (Washington, D.C., 2006).

10 U.S. Department of Homeland Security, *National Interoperability Baseline Survey* (Washington, D.C.: The SAFECOM Program, 2006), 23.

11 Ronald P. Timmons, "Radio Interoperability: Addressing the Real Reasons We Don't Communicate Well During Emergencies" (Master's Thesis, Naval Postgraduate School, 2006).

12 Staff, *The 9/11 Commission Report, Eleventh Public Hearing* (New York: W.W. Norton & Company, 2004).

13 Further information about *Strong Angel* is available at http://www.strongangel3.net/files/sstr_20061107_web.pdf and http://www.strongangel3.net/files/SAIII_working_report_20061106.pdf.

14 *SAFECOM: The Road to Interoperability.*

15 Nita Lewis Miller, Naval Postgraduate School, Monterey, CA, and Lawrence G. Shattuck, U.S. Military Academy, West Point, NY., *A Process Model of Situated Cognition in Military Command and Control,* 2004.

16 *SAFECOM: The Road to Interoperability.*

17 Gary Klein, *Sources of Power: How People Make Decisions* (Cambridge, MA: Massachusetts Institute of Technology, 1998), 16.

18 "A cognitive bias is a tendency to mentally process information in a particular way…people tend to seek out information that confirms their preconceptions and to discount information that disconfirms their preconceptions." Jeffrey P. Richer, Ph.D., Scottsdale (AZ) Community College, Unpublished curriculum, http://www.sc.maricopa.edu/sbscience/psy266/lessons/essays/essay9.html.

19 Herbert Morrison, *The Hindenburg Broadcast*, May 6, 1937, http://www.eyewitnesstohistory.com/vohind.htm.

20 "The words stuck in my throat. A sob wanted to replace them. A gulp or two quashed the sob, which metamorphosed into tears forming in the corners of my eyes. I fought back the emotion and regained my professionalism, but it was touch and go there for a few seconds before I could continue." [Sentiments of TV Anchorman Walter Cronkite as he announced the words: "From Dallas, Texas, the flash—apparently official. President Kennedy died at 1 p.m. central standard time—a half hour ago…"], http://www.tvrundown.com/lostfilm.html.

21 E. A. Butler, et al, "The Social Consequences of Expressive Suppression," *Emotion* 3 (2003): 48–67.

22 Timmons, "Radio Interoperability."

23 Butler, "The Social Consequences of Expressive Suppression," 48–67.

24 Timmons, "Radio Interoperability."

25 Ibid.

26"Jurisdictions will be required to meet the FY 2006 NIMS implementation requirements as a condition of receiving federal preparedness funding assistance in FY 2007." U.S. Department of Homeland Security, *The NIMS Integration Center, National Standard Curriculum Training Development Guidance* (Washington, D.C., 2005).

27 "The NYPD and the FDNY were two of the preeminent emergency response organizations in the United States. But each considered itself operationally autonomous. Each was accustomed to responding independently to emergencies. By September 11th neither had demonstrated the readiness to respond to an 'Incident Commander' if that commander was an official outside of their Department." National Commission on Terrorist Attacks Upon the United States, Eleventh Public Hearing, May 18, 2004.

28 National Task Force on Interoperability, "Why Can't We Talk? Working Together To Bridge the Communications Gap to Save Lives. A Guide for Public Officials," February 2003, http://www.safecomprogram.gov/SAFECOM/library/interoperabilitybasics/1159 nationaltask.htm.

29 Robert Zanger, U.S. Department of Justice "Communications Interoperability: It's More About People Than Technology" (presented at the annual international meeting of the Association of Public Safety Communications Officials, Orlando, Florida, August 9, 2006).

30 Staff, "Police 10-Codes," *Police Chief Magazine*, October 2005. "Homeland Security Secretary Michael Chertoff announced during his remarks at the 112th Annual Conference of International Association of Chiefs of Police in Miami Beach, Florida, on September 27, 2005, that the abolition of the police 10-codes will not be necessary for NIMS compliance." Secretary Chertoff stated, "Under the implementation of the National Incident Management System there has been discussion of requiring the elimination of the 10-code in every day law enforcement communications. However, there was a strong response from the law enforcement community against this proposal, and we listened to your concerns."

31 Jonathan S. Smith, "Work Channel: A Practical Guide to Improved Radio Communication, A Guide for Public Officials," *9-1-1 Magazine*, July/August 1997.

32 National Commission on Terrorist Attacks, 2004.